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## A Microcomputer for the Farm Family

Craig L. Dobbins

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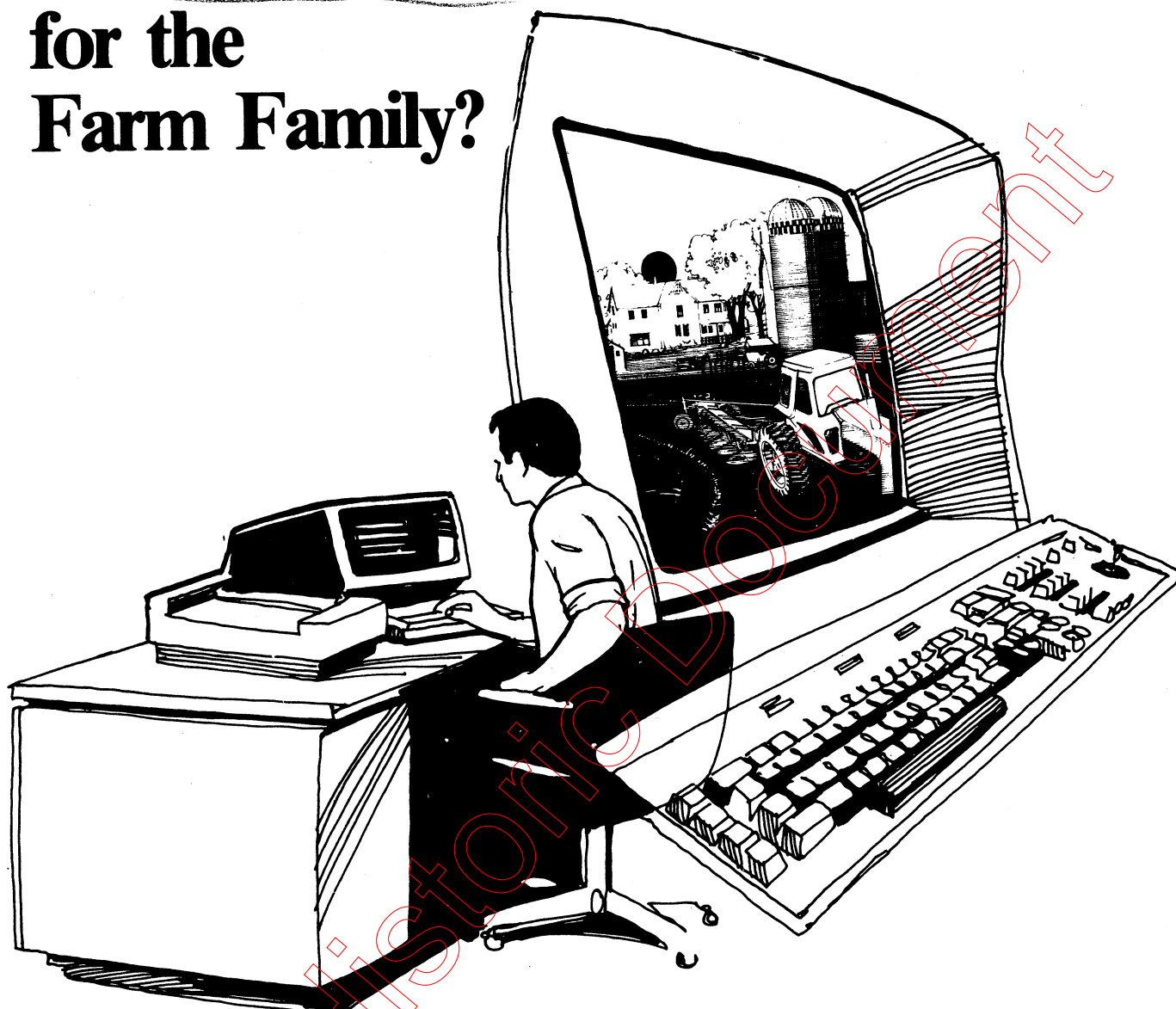
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# **A Microcomputer for the Farm Family?**



Cooperative Extension Service, Purdue University, West Lafayette, Indiana 47907

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# A Microcomputer for the Farm Family?

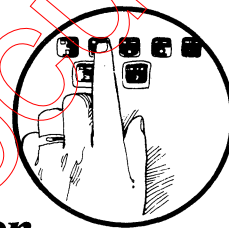
*Craig L. Dobbins and Robert C. Suter, Department of Agricultural Economics*

The next explosion of technology to affect the American farm family may well be the microcomputer. Some persons now foresee the impact of the microcomputer equaling that of the farm tractor in the 1930s. Some are predicting that the well-managed commercial farm family cannot afford not to have one and that a microcomputer in the farm office will be as common as a sugar bowl in the kitchen by the end of the 1980s. If so, that thing called "change" will again challenge every commercial farm and ranch operator both today and tomorrow.

One may well ask the question, "Why?" The task of keeping the farm or ranch records, whether for financial, tax, or other purposes, is a very tedious one and has never been particularly enjoyable. The time and the arithmetic involved in making farm decisions are very demanding. The economic feasibility of investing in another 160 acres, a new seed processing plant, or a large livestock facility has often been resolved without any formal economic analysis and sometimes without even a sharp pencil. With a microcomputer all of this could change.

The microcomputer could easily be the greatest gift ever to a farm or ranch family. However, it could also be the most troublesome technology yet. Whatever the case, the challenges, the costs, and the economic benefits (assuming such can be measured) should be exposed before investing in a microcomputer. The present-day costs appear small relative to the promised results. How-

ever, both the costs and the results are somewhat deceptive. Given the present state of the arts and the nebulous nature of any measurable results, the feasibility and use of a microcomputer is a very difficult question.



## Definition

In the 1950s most computers filled an entire room. They were essentially central data processing facilities. However, they were justified only where a number of jobs were to be performed and were repetitive. Data preparation was generally done elsewhere. Various persons or parties submitted large batches of paper work to a keypunch operator who then punched all relevant data onto punch cards. These cards were in turn processed in batches at the centralized facility. The user who wanted some sort of an analysis had to submit his cards to the computer and wait. Sometime later, usually 2 to 4 hours if things worked, the output became available. If there was an error, the job had to be resubmitted.

Since then many things have happened. A whole series of dramatic changes in electronics occurred during the 1960s and 1970s, and as a result the microcomputer has come upon the scene. The early vacuum tubes have been replaced by semiconductors and integrated circuits and, more recently, by extremely densely packed silicon chips called microprocessors. In fact, much of the internal memory and processing logic may today be contained on a single silicon chip the size of a dime. As a result, today's microcomputer is substantially smaller. The entire system often sits on a desk top. Furthermore, it generally costs less than \$16,000.

The hardware or equipment includes a cathode-ray tube which provides a visual display of up to one thousand alphanumeric characters on a television-like screen and is "conversational" in nature. The terminal typically includes a typewriter-style keyboard with a number of special control keys which edit one's commands, check on the transmission of data, and indicate the end of each message. The system generally includes a magnetic tape or disk for data storage, along with a printer which provides immediate output on hard copy.

The microcomputer is more powerful than might be expected. It has a broad range as to capacity, memory and storage. Software support is gradually becoming more plentiful. The programming process is becoming more efficient as the language requirements have been reduced. A new range of peripheral equipment, such as printers and automatic paper feeders, has become available. The dollar costs have been reduced. And all of this has occurred during a period in which the need for data processing and the cost of handling data (conventionally) have both increased.

However, the real plus is not just the size of the computer or its cost, but the modus operandi. Like its large ancestor, the microcomputer has memory, it can be programmed, it typically has a very versatile input-output capacity, and it is no longer restricted to special applications. Its use is limited

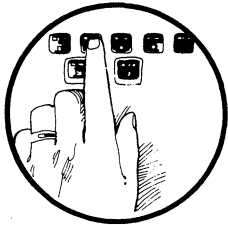
only by the creative ability of the owner.

The quicker or earlier capture and analysis of information have made the microcomputer a much more effective approach to problem-solving. The user can now have "interactive dialogue." In other words, he can "visit" with the computer. A technical staff is no longer necessary. The keypunch operator and punch cards are no longer needed. Data can be "typed" or entered into the system via the keyboard-typewriter. The data can then be visually checked on the cathode-ray tube (CRT).

Depending upon how well the computer is programmed, the operator may be requested to make certain entries and answer certain questions, usually in abbreviated English. Should a particular entry be invalid, the operator or user is informed immediately and is requested to reenter the data. No longer does one have to submit a batch and wait. Adjustments can be made and errors can be corrected immediately. Thus, the work is here and now rather than at some central facility.

The microcomputer not only accepts information from the operator and tests it immediately, it may file that information for subsequent retrieval, move data from one place to another, all the while sorting, collating, merging, and perhaps getting rid of some of it in the process. Best of all, certain arithmetic and logical operations can be performed. Finally, the answers alone can be printed. Once a microcomputer is operative, which is no small task, it allows a completely decentralized approach to problem-solving and decision-making.

There is still a need to coordinate and integrate traditional decision-making principles with present-day microcomputer philosophy. However, it now appears as though the microcomputer will be cost effective in terms of reducing the amount of effort involved in both data handling and word processing. It also appears that the microcomputer will fulfill that long-held promise that a computer can extend a businessman's intelligence. If so, it is destined to become universally useful in both the farm or ranch home and the business.



## *The Hardware Packages*

The microcomputer is best described in terms of its hardware, which is physical in nature, and its software, which is more or less intangible. The various hardware packages consist of a central processing unit (CPU), some device with which to enter the data, a storage unit, a printer or output device, and perhaps some additional communications equipment.

The central processing unit is the traditional little black box, containing both intelligence and memory. The modern-day version contains a number of "printed circuit boards" which are the heart and life blood of the microcomputer. On top are mounted transistors, capacitors, chips, and other electronic marvels. Underneath are ribbons and ribbons of solder through which flow various electronic impulses.

The central processing unit is the component that does all the arithmetic. It makes whatever comparisons are called for by the program or the instructions and does the work. Hence, it is the core of every microcomputer system.

The input device is typically a typewriter-type keyboard with a few extra keys and a cathode-ray tube (CRT) or video display terminal (VDT). The keyboard is used to enter both instructions and/or data into the computer. Each item is displayed on the video screen. This is what allows that thing called "interactive dialogue"--immediate error corrections, feed back, and other adjustments.

The typewriter keyboard and video display terminal have made the microcomputer a challenging and exciting bit of technology. A full-sized screen--80 characters across and 24 lines up and down--allows the operator to examine a large amount of data and/or several instructions at one time. The more popular versions allow a dual intensity of light, whereby some characters are displayed more brightly than others. Some allow a reverse image with light letters against a dark background rather than dark letters against a light background. Still others allow color graphics to be used. The interactive dialogue "on the screen" has revolutionized the data entry methods and made the punch cards and the batch processing of data obsolete.

The microcomputer is capable of remembering information. The component that performs this function is called memory. There are two types: primary memory and secondary memory. The primary memory consists of two types: read-only memory (ROM) and random access memory (RAM). The read-only type is used largely to store frequently used instructions, whereas the random access type can be used to store either instructions or data. The read-only memory is not available for storing user information, so an important consideration is how much random access memory is available.

The capacity of the RAM memory varies depending upon the microcomputer. In nearly all systems, the RAM memory can easily be expanded; however, there is a limit. (Every so often the amount of information to be stored exceeds the storage capacity.) There is one further problem. When power to the computer is shut off, the information stored in the random access memory is typically lost. For these reasons, it is important to include considerable secondary memory or storage as a part of any computer.

All memory--both that which holds the instructions for the current task(s) and that which holds the data to be processed--is measured in units of "K," each of which holds or equals about 1,024 characters. Thus 4K memory is ca-



pable of storing about 4,096 characters of information, 8K--8,192, 16K--16,384 characters, etc.

A storage unit or warehouse is required to store all programs or instructions not currently being used. These storage facilities may consist of magnetic tapes, which were used by the earlier microcomputers, or plastic disks or diskettes similar to 45 rpm records. Depending upon the system a cassette tape recorder or a floppy disk drive will thus be required.

Both magnetic tapes and disks or diskettes are capable of storing large quantities of data. The tapes are more universal and are frequently used to transfer data from one computer to another (e.g., a program or mailing list). However, the disks, which vary all the way from the 5 1/4-inch "floppy" disk holding several thousand characters to the larger "hard" disks holding millions of characters, are much quicker than tapes in terms of data retrieval. They allow much faster microcomputer operations.

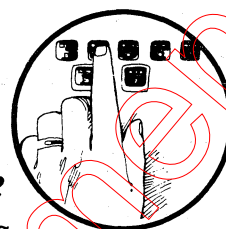
The output device or printer provides a permanent record, once whatever instructions are "punched in" and once whatever appears on the screen is acceptable. These printers come in all sizes and shapes. They vary from 80, to 120, to 132 characters in width. They may be character printers which look like and act like a typewriter, or line printers which print an entire line at a time. The less expensive use sprockets and feed-in paper with pin-feed holes along the edges. The more expensive ones feed in single hard copy sheets, 8 1/2 x 11. The paper may be plain or pre-printed with logos, headings and columns.

The microcomputer system may also include some communications hardware. One of these is referred to as a "modem" which is short for modulate-demodulate. This device, which can both send and receive signals, allows the microcomputer to communicate through an ordinary telephone. The typical modem consists of an acoustic coupler and rubber gasket into which the telephone receiver fits. The more traditional purpose is to link a remote computer terminal with a larger

computer processor. However, a modem may also be used to solve a programming problem in that a programming company can analyze and maybe correct a software problem from a remote location. One of the more sophisticated modems allows a microcomputer to answer the telephone whenever a call comes in.

All of these component parts are referred to as computer hardware. They vary considerably in type and size or capacity, and in compatability. There are numerous "breeds, types and classes."

## *The Software Packages*



While the microcomputer hardware may look intriguing, no microcomputer will function without a software program or set of instructions. The software program operates the physical devices, controls the hardware, and tells the computer how to perform each of its tasks. Computers are not intelligent or smart; they are just the opposite. They must be told what to do at all times. Thus, every microcomputer system requires a software program appropriate for whatever use is to be made of the microcomputer.

There are three general types of software associated with a microcomputer system: the operations software, a computer language interpreter or compiler, and the applications software. The operational program is a very complex one determining computer performance. It acts as the central command, deciding what parts of the computer are to be employed and when. It is usually written by a special team of programmers called "system programmers" who are employed by the microcomputer manufacturer. The operations software is usually included with the microcomputer hardware.

The better operational programs are written with the purpose of not only handling all of a given computer's operations, but also making any subsequent programming easier. However, the owner or user is not generally able (or even advised) to attempt to modify an operational program. The operations software makes the computer function. It establishes the computer's limits. And unfortunately, it makes each brand of microcomputer somewhat unlike all others. Hence, operations programs differ in their capabilities, and comparisons are very difficult to make.

The computer language interpreter or compiler translates the software programs written in a language used and understood by the programmer to a language that is understood by the computer. Any one of several different languages may be used. However, this also is largely specified by the microcomputer manufacturer.

All subsequent software programs are applications programs. There are about as many varieties as there are applications. They require the very best experience on the part of the person who writes each program, for he has to be not only knowledgeable about computer programming and the computer on which it is to run, but also about the area of application. This simple thought has not always been apparent to many computer enthusiasts, and as a result, it is the origin of many a problem.

In fact, it is a very real problem in the purchase and use of a microcomputer for a farm business. Most computer programmers, even some of those who have worked on farm records, have little or no knowledge as to the data that are needed for farm decision making. Farm financial data tend to differ from that required by the nonfarm business. The farm family needs a record of the many physical items--for example, pounds of fertilizer applied, bushels of corn produced, pounds of feed fed, and pounds of milk sold, as well as the dollar and cents figures. Furthermore, these physical items often need to be related to one another as well as to the different farm enterprises.

In obtaining good application programs, the microcomputer owner has several alternatives. First, he can contract for, or purchase a custom-designed program written specifically for his particular farm business. This alternative is generally made available at the time the hardware is purchased. The sales representative or an assistant and the farm or ranch owner generally work together in its design. A custom-designed program may save considerable time and effort in terms of getting a microcomputer into operation. However, the amount of time saved is variable and very difficult to estimate. Acquiring programs in this fashion also requires a large dollar outlay.

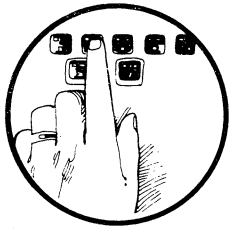
Second, a new owner may find an already-packaged applications program that fits his particular situation reasonably well. That program may be purchased from a software company different than the hardware manufacturer--one specializing in software programs. However, determining whether a given software program is useful is more than just "finding" a program with a description that sounds like it fits. The process should include determining (a) the brand of computer required to use the program, (b) whether the program does what is desired, (c) whether there is adequate documentation, and (d) whether assistance will be provided to help learn how to use the program and interpret the results.

Every new computer owner needs to make sure an applications program is compatible with his particular hardware's operations program. There are strong packages and weak packages and expensive packages and cheap packages. However, if the program will not work on your computer, it is of limited value regardless of its characteristics or price. Thoroughly investigate hardware, operating software and computer language requirements before purchasing applications software.

Third, a new owner with sufficient time, some desire, and some expertise may decide to develop his own software. There are many do-it-yourself programming books. Typically, one is distri-



buted by the hardware manufacturer as a part of the hardware purchase. These programming instruction booklets are sometimes well written. Furthermore, some persons find that they have a natural talent in this area. The person who has that programming talent as well as a knowledge of a given farming operation can undoubtedly build a computer program that will be quite advantageous. However, regardless of what some computer manufacturers infer, computer programming requires considerable time and effort.



## ***Computer Languages***

Every computer's internal nature is such that it relies on electrical impulses. For this reason a machine language based on a whole series of 1's and 0's is required. Each number and each letter in the alphabet have a specific and distinct code consisting of some combination of 7 bits each representing a 1 or a 0. D is coded 1000100 when it enters into machine manipulation. However, all of this is somewhat academic as far as a microcomputer owner is concerned.

There are computer languages and computer languages, from the very sophisticated, highly confusing, and unintelligible language that only a computer expert should worry about, to that which is almost plain ordinary English and which most anyone can soon learn. Each hardware manufacturer generally publishes a reference manual which specifies the rules to be followed with their particular computer. However, each microcomputer also tends to have its own language, and each language tends to have its own vocabulary, grammar, and syntax.

Some languages require considerable mathematical ability to understand and develop an applications program. They also require considerable documentation if someone other than the program writer himself ever attempts to use or change the program. Other languages are fairly easy to read. They may use meaningful words--add, multiply, go to, if, etc. as well as a number of familiar names--for data identification purposes--to identify the program functions and data blocks.

When an owner-user decides to design his own application programs, he needs to anticipate the more usual abbreviations and data names that are standard labels or could become so. In this fashion, he can design his own particular programs with some degree of clarity and efficiency in both remembering and using the various input functions. This saves considerable time and future frustrations.

There are several computer languages. No matter which one is selected, the person attempting to learn the rules for the first time may be enormously clumsy. Yet, once the various rules as to grammar, logic and syntax are mastered, any computer language becomes highly efficient.

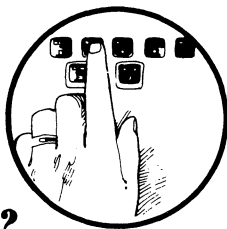
One of the first universal and highly acceptable programmable languages was FORTRAN which is an abbreviation of formula translation. FORTRAN was developed primarily for scientific purposes and to enable the very sophisticated engineer and others to translate algebraic and mathematical formulas into a quick and easy computer language. It was developed to work specifically where various numbers are to be compounded, as in an exponential expression, and where a large number of decimal places are needed if the final answer is to be accurate. FORTRAN thus meets some rather rigorous industry standards and is used in many of the more complex calculations. While it is extremely useful to the professor and his graduate students, it is not easily understood by the man on the street.

The language most commonly used for microcomputers is BASIC, which is the acronym for Beginners All-Purpose

Symbolic Instruction Code. It still allows considerable scientific expression, yet is simpler, clearer, and easier to understand than FORTRAN. The major improvement is that it allows one to use more meaningful abbreviations and names, thus improving program legibility, documentation, and data identity. However, various attempts to simplify and clarify this programming language has led to several versions of BASIC, resulting in considerable variation in the language being used from one microcomputer to another.

Finding a program written in BASIC does not necessarily mean that the program will work on any microcomputer. Before the program will "run," certain modifications may be needed. These might be both time consuming and frustrating. The important idea is to make doubly sure that the applications program language used by anyone doing his own programming is compatible with the manufacturer's operations program (or compiler) and that the latter will convert the applications program into the machine language used by that particular microcomputer.

### ***What's My Problem?***



The decision to purchase a microcomputer is an ideal time for some long-term creative thinking. Management should take the time, every now and then, to develop an accurate, clearly defined, and realistic set of goals and objectives. Unfortunately, some persons view a microcomputer as a goal or an end in itself. This it is not. It is, instead, the means of accomplishing a given set of goals and objectives more rapidly and more efficiently.

A review of the farm or ranch business and the family's desires is ex-

tremely helpful in the purchase of a microcomputer. It can affect, if not direct, every aspect of the business as well as the life of the family in the future. A prospective purchaser should take a serious look at his present modus operandi. He should think about some of the manual improvements that could be made and work out a long-term business plan. In this fashion, he is more likely to make a good decision.

The person who has a fair idea that the microcomputer might be useful in his business faces a huge number of alternatives--so many in fact that a good decision is somewhat difficult. The farm or ranch family is generally desirous of obtaining a computer package that will get one started fairly quickly, one in which all of the pieces (both hardware and software) are compatible, and one with sufficient flexibility so that additional components can be added in the future. The farm or ranch family is also hopeful that what they buy today will not be obsolete and/or half price tomorrow.

Many microcomputer manufacturers have entered the market, with many varieties of hardware and software--games, record-keeping, investment feasibility, and text-editing capabilities. The office equipment manufacturers have developed word processors, along with many bookkeeping and financial packages. Some are merely interested in selling machinery, and they leave a new owner on his own. Some do a fair job of integrating the entire system--both the hardware components and software programs. Some of the companies or business representatives ask the prospective owner--user about his business, his problems, and his needs, and they then develop and recommend a specific computer system for him.

The purchaser of a microcomputer also varies in terms of his objectives from something to help educate the children or to keep track of which cows are bred and which aren't, to something that will "post" the cash farm receipts and expenses, analyze the business at the end of the year, and provide all of the information required to fill out various income tax returns. A microcomputer is

often purchased with only one or two objectives. Then, after the owner-user becomes acquainted with some of the possibilities, he decides that it might just be useful in several additional areas. Hence, there is need for more memory or storage, for additional software, and for additional add-on equipment.

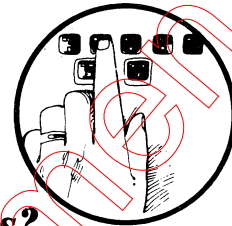
A microcomputer may be most useful in ascertaining the optimum level of water or fertilizer, the corn versus soybean profit levels, the least-cost combination of feeds, and/or the break-even price for each group of feeder pigs. It may be most useful in determining whether a given capital investment (e.g., an additional 160 acres or a new hog house) is feasible, and in charting the day-to-day variations in December corn, November beans, and/or July hogs.

There may be other objectives--Junior likes to play chess, he needs help in high school algebra, and he hates writing (actually rewriting) English themes. Dad could use it to keep track of all the entrants in the tractor-pull contest. Mom might just type in her favorite recipes and the Christmas card list. There are numerous possibilities as to family activities as well as farm business.

Before purchasing any microcomputer, analyze your business and family problems and think about a microcomputer's most likely use. What are our problem(s)? What are our needs? Where will a microcomputer pay off? Where else might such be used? Put together (1) a set of all currently kept records--land use, livestock production, inventories, depreciation schedules, employment and payroll records, cash accounts, tax returns, (2) a list of all information needed both day-today and every now and then and for decision-making purposes, and (3) a list of all the other tasks that a microcomputer might do. Each task should be described as concisely as possible.

With a list of all currently kept farm records, a list of information needs, and a list of all other possible activities, the microcomputer's business representative is usually most helpful in assessing the components that are needed and in determining the programs that are required.

## *What Are My Alternatives?*



The first decision is whether to purchase a complete hardware system from one manufacturer or various components from different companies. The component approach allows somewhat more selection in terms of applicability and performance, yet the compatibility of the various components must be very carefully checked, along with the possibility of adding additional equipment in the future.

Some vendors (manufacturer representatives) will assemble a system, test it, and provide training in its use. Others merely sell the machinery and let the new owner figure it out himself. The same is true of service. Some dealers provide local service while others have to send a faulty machine back to the factory. Every purchase--microcomputer or other equipment--should undoubtedly be preceded by a visit to other businessmen who have already purchased a given system to check with them about their experience. A list of these people can usually be obtained from the salesman. This could save a lot of time and effort and both money and frustration in the future.



The hardware components for a farm family microcomputer will probably include some or all of the following:

1. A typewriter-type data entry device and a video display. Punch cards and tapes (paper or magnetic) should not be considered. The display tube should be at least 80 characters in width and should display at least 24 lines (double spaced). It is desirable to have good editing and correction overrides at this point.

2. A central processing unit sufficient to operate all of the system's current components and perhaps several additional ones that may be added in the future. The operations program, which generally comes with the hardware, should be one which can run an easy-to-use tape and disk system that is compatible and reliable, and a BASIC machine language compiler or interpreter. Detail specifications should be available along with at least 32K and preferably 64K of memory.

3. Dual disk drives (one to use for programs or instructions and the other for data) and perhaps a cassette tape for back-up purposes. The initial disk storage must be sufficient to store all of the probable functions and applications. It should be modular and thus easily expanded in the future.

4. A printer capable of printing both upper and lower case characters in a word processing text or table-editing mode. This component should be a highly reliable one, as any downtime for repairs can affect the availability of the results.

5. A telephone hook-up or modem allowing access to data and applications programs from other computers over a telephone. This is the one component that may be deferred, depending upon the need or desire to have current weather, market information or application programs.

These five components perhaps go beyond any given farmer's initial needs. However, to purchase less may be like purchasing a 16-foot diameter silo a few years back when the 24 footers were coming on the market. The above hardware will cost \$4,000 to \$16,000, yet will

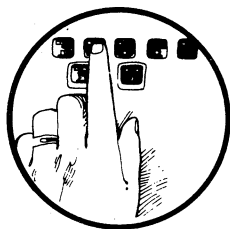
provide the flexibility desired by most farming operations.

The alternatives as to hardware are simple compared to those relative to software. Unfortunately, a microcomputer is no better than its applications software. The advertisements imply that once you buy a computer you can play games with the kids, help them do their homework, budget next year's cropping system, keep track of all the sows, have a complete cash flow at any time, enjoy up-to-date weather, prices, and news, and have all of this communication in rainbow colors. Yet, every one of these jobs requires a specific set of software instructions.

The advertisements also infer that a new owner can write his own software programs, poking them in himself. However, programming for the majority of owners and users is a difficult talent to acquire. The uninitiated often find that it leads to considerable frustration.

Canned off-the-shelf software is available from many sources. At the present time there are numerous programs available with the prices ranging from zero to several hundred dollars each. In practically all instances the software program is an unknown. Variations in a program's mechanics and/or format specifications typically limit a given software program to the particular problem for which it was designed. This means that one has to accept and use a particular program as is, make or hire someone to make modifications so the program is more useful, or hunt for a more flexible program assembled by an independent company.

In some instances, the programs don't perform according to their specifications. In many instances, they are not readily applicable to a particular farm business. When this is so, some programs are no bargain at any price. A demonstration program or two may show a prospective purchaser how simple it is. However, the only way to check one out or be certain, is to see that program perform.



## ***What Should I Look For?***

1. The first software program needed by practically every farmer today is one that tabulates beginning- and end-of-the-year farm inventories, that develops all farm depreciation schedules for income tax purposes, that classifies and totals all cash farm receipts and cash farm expenses, and then calculates an end-of-the-accounting period income statement and perhaps a current year income tax return. To the extent that physical quantities of various farm resources and farm products are desired and/or included, this will be a very difficult program to find. This first program should therefore be one that allows for some redesign, and furthermore, one that can be updated every now and then.

2. Some farmers will want the opportunity to design and develop a program or two of their own, specifying a crop and fertilizer program perhaps, a breeding and feeding program for milk production, and/or one which keeps track of the sows, the pigs per litter, the feed fed, and the rates of gain. These are specialized enterprise accounting programs, but they're not generally available commercially. As a result, individual farmers with some degree of talent are probably going to design them on their own. What's required? Every farmer with a desire of this nature needs to check out the hardware manufacturer's instruction manual to see if the instructions for that particular computer are fairly straight forward.

3. Many farmers may want to subscribe to a data-bank organization's time-sharing program whereby they can get the most recent commodity prices,

along with whatever market analysis that is available. These data may include the weather as well as the most recent market data and in some instances, general news bulletins as well. The time-sharing organization may also provide sports, movie reviews, and other information, even special programs such as TAXTIPS.

In some instances, the computer becomes an electronic bulletin board, allowing all subscribers to communicate with one another. The costs (or rates per hour) vary throughout the day with the highest rates being charged during the peak hours of use. A telephone (private line) plus some companion or auxiliary on-line equipment is generally required.

4. Generally available are a number of smaller programs which do most anything. These programs are aimed at particular problems--checkers and chess, beginning algebra, household budgets, Christmas card lists, recipes, health and exercise programs, mailing lists, and many others. These smaller programs are available from many sources, including the program-it-yourself owner-user. However, one needs to investigate the transferability between microcomputers. A program that will operate on one system might need modification to run on another. In each instance, the program may or may not be well documented and/or tested.

Thus, there are several to many sources of applications programs. It may be possible to purchase the desired program from a company that specializes in software. It may be possible to develop or obtain applications programs from some of the land-grant universities. The easiest way to get the exact program desired is to hire a programmer to create a custom program. However, this is quite likely to also be the most expensive. Acquiring programs written by others may serve as a source of software; however, the documentation that accompanies some of these programs may be poor. Furthermore, many of the programs provided by individual users have not been checked for errors.

There are several questions that should be raised with regard to any packaged software program:



1. Is this program compatible with the particular microcomputer on which it is to be used? Is the higher-level compiler language or interpreter available?

2. Is the program documented to the extent that its logic is easily understood and its applicability (or lack thereof) is readily apparent? What does the outline, the narrative, the flow chart, the file layout, and the entry and other instructions for the operator look like? Documentation should describe the kind of information needed to use the program, how the results are obtained, and an explanation of how to interpret those results. For the more complex programs, this may mean that some kind of training in the use of the program is desired.

3. Is there a minimum warranty period during which the software supplier "stands behind" or fixes any particular problem with the program?

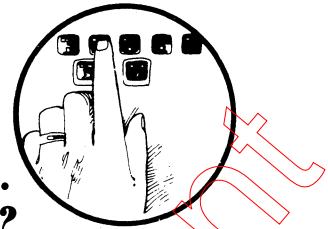
4. Must the program be used as is, or can the program be tailored to fit the peculiar characteristics of the business? Can the program be reduced or expanded? And if so, will the company help do this? In other words, who is responsible for the modifications?

5. Once the program is modified, does it still belong to the company or is it property belonging to the farmer? Can the farmer lend or sell it to a neighbor?

6. If, in a year or two, the program needs modification and/or updating, what are the alternatives available at that time? (For example, the income tax regulations may not change, but the tax brackets and rates may change.)

Applications software cannot help but get better, simpler, and less expensive in the future. This may mean that a microcomputer purchase should be delayed. Yet, after studying the present day possibilities one may decide to purchase a microcomputer, purchase some applications programs and design some individual programs. This takes time today but will save a tremendous amount of time in the future.

## *When I Purchase... Then What?*



In getting acquainted with a microcomputer, it is desirable to have some training on how to use your particular system. Some manufacturers infer that all you need do is take the computer of your choice home, plug it in, and in a matter of minutes run whatever program has been purchased and/or written. This is seldom the case. Considerable time is required to become familiar with the procedures needed to operate a microcomputer.

Most all computer manufacturers provide self-instruction manuals that explain various steps. However, these manuals are often difficult to understand. If the computer does not respond, as the manual indicates it should, it is helpful to have someone available to answer questions. In fact, the learning process is greatly enhanced if some training is provided by the manufacturer to acquaint a new owner with the basic operations of the computer.

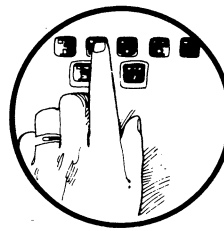
Learning to program a microcomputer or to modify a purchased program requires knowledge of a given computer language. The difficulty of this task will depend upon the computer and also upon the language. A high-level language, such as BASIC, takes less time than the lower-level languages. There are several to many manuals available

which describe the characteristics of various languages and the rules that must be followed. However, learning to program a microcomputer is accomplished only through practice. Several computer companies offer classes in computer programming. This is a tremendous help in learning to write programs.

The computers being sold today are considerably more reliable than those of 20 years ago. The most susceptible components to breakdown are the mechanical parts, such as the printers and disk drives.

The methods used by various manufacturers to service computers vary. Some companies provide local computer servicing. This method is generally fairly quick, and it allows the use of the computer to be regained fairly soon. Service personnel may come to the home or office to make the needed repairs; in other instances, an owner-user may have to take a component that needs repair into the local store. In these situations where the company requires the component to be brought in, it (the component, i.e.) may be sent to a regional service center or to the factory for servicing. This kind of servicing requires time. In fact, it may take several weeks. The service company may, of course, provide a replacement component while yours is being repaired. However, it is best to know their policy before purchasing a microcomputer.

While repairs to a computer system are not needed frequently, they can be costly. Several computer companies provide service contracts which cover the cost of periodic service calls and repairs. These contracts are similar to insurance policies in that a certain cost is traded for a larger and uncertain cost that may never occur.



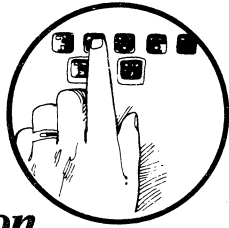
## ***To Whom Should I Talk?***

The prospective microcomputer owner may want to visit with several hardware or equipment manufacturers and/or to start with some of the software houses. The latter provide programming, consulting, and other computer services. They may or may not sell the hardware. They usually provide across-the-board consulting services--both hardware components and software programs.

The computer-services distributor typically offers a "turnkey package" which includes the needed software as well as the various hardware components. His "pay" includes all profits on the sale of the software plus the dollar differences between his costs (or discounted prices) and the list prices on any hardware he sells. The farm owner may want to obtain the best of all computer processors, peripheral equipment, and software packages from several different manufacturers in this particular fashion. Furthermore, the computer-services distributor is usually less reluctant to become involved with a prospect's business problems.

Nevertheless, before buying a microcomputer, a farmer should ask to visit with one or more of the firm's previous customers, someone who has purchased a similar system. And again, the real secret is to make sure that the software programs fit the problems.

## ***The Final Decision***



Sooner or later the farm family needs to sit down, tabulate, and compare alternatives. A specific set of questions and a definite answer to each should be ascertained with regard to each alternative. A surprising number of questions are never raised (and furthermore, they are never answered) unless some of the answers are recorded on paper. An objective tabulation eliminates the salesman's personality and some of the company bias. Hence, a fairly sizeable tabulation sheet is quite useful for decision-making purposes.

Lastly, a microcomputer is not likely to save a lot of labor that can be used more productively somewhere else. The farm family is likely to be just as busy as ever. A major benefit is that less time will be required to do the arithmetic--the totalling, the calculations, and the checking. More time will be available to analyze the problems and study the results.

The real benefit is that the information required to make decisions will be more readily available. This additional information will vary from individual to individual. However, it is this information that leads to more day-to-day control over the management of a business and that will determine whether a microcomputer is a good or a poor investment.

Regardless of the system selected, expect some frustrations. If new innovations are enjoyable challenges, a microcomputer could be a great investment. If a well-tested ("let someone else get the bugs worked out") piece of equipment is desired then the purchase of a microcomputer should be delayed. However, given time, the microcomputer is likely to become a powerful and useful decision-making aid in the management of the farm business.

# Decision Making Tabulation

	Alternatives		
	A	B	C
<u>Systems Distributors</u>			
Software sources			
Hardware sources			
<u>Check for Software Availability</u>			
Program FINANCE			
Program PHYSICAL DATA			
Program TEXT EDITING			
Program _____			
Program _____			
<u>Program(s) Documentation</u>			
Machine language			
Narrative			
Flow chart			
Entry instructions			
Sample output			
Modification needs			
<u>Hardware Components</u>			
Typewriter keyboard			
Video display terminal			
Size (width, lines)			
Central processing unit			
Disk storage			
Memory			
Printer			
Size (paper)			
Expansion alternatives			
<u>Rental or Lease Arrangements</u>			
<u>Maintenance Costs</u>			
Type of service			
Warranties			
Cost per month			
Duration			
<u>Other Local Owners</u>			
References			
<u>Total Sales Price</u>			

# *Computer Jargon and Buzz Words*

Access time: the time required to retrieve information from the computer.

Address: A number specifying where a unit of information is stored in the computer's memory.

Assembly language: Programming language using groups of letters; each group represents a single instruction.

BASIC: (Beginner's All-purpose Symbolic Instruction Code.) A relatively easy-to-use computer language that comes with many small and personal computer systems.

Batch processing: Literally, a batch of programs or data which has been accumulated in advance and is processed during a subsequent computer run.

Baud rate: The speed at which information is exchanged over communication lines, generally expressed in bits per second.

Binary: The basis for calculations in all computers, this two-digit numbering system consists of the digits 0 and 1, in contrast to the ten-digit decimal system.

Bit: The smallest unit of information that the computer recognizes, a bit is represented by the presence or absence of an electronic pulse, 0 or 1 (see binary).

Bug: A fault or error in a computer program.

Byte: A byte is composed of several bits (usually 8). A byte is used to represent one character (a number or letter) of information.

Chip: A thin silicon wafer on which electronic components are deposited in the form of integrated circuits. Technologically, the key to the micro-electronic revolution in computers.

COBOL: (Common Business-Oriented Language.) A high-level programming language widely used in business applications.

Computer program: A collection of instructions that together perform a particular function.

Compiler: A special program that converts a programming language into machine language.

CPU: (Central Processing Unit.) The part of the computer that controls the interpretation and execution of the processing instructions.

CRT display: (Cathode Ray Tube.) A television-like screen which may be used for viewing data program instructions.

Data: The raw information within a computer system.

Density: A term used to describe the distance between the magnetized spots on a magnetic tape or floppy disk. The higher the density, the more data can be stored on a given tape or disk.

Diagnostics: Programs for detecting and isolating a malfunction or mistake in the computer system; features that allow systems or equipment to self-test for flaws.

Disk: A revolving plate upon which data and programs are stored.

Disk memory: Memory using rotating disks as its storage element.

Downtime: The period during which a computer is not operating because of a machine fault or failure. Downtime consists of repair delay time, repair time, and machine-spoiled work time; as opposed to available or idle stand-by time in which the system is functional.



EDP: (Electronic Data Processing.) The transformation of raw data into useful information by electronic equipment; sometimes referred to as ADP, or automatic data processing.

Floppy Disk: A small, flexible recording surface that looks a lot like a 45-r.p.m. record contained in a protective cover.

FORTRAN: (FORMula TRANslation.) A computer language widely used to solve scientific and engineering problems.

Hardware: The physical components of the computer processing system, for example, mechanical, magnetic, electrical or electronic devices.

IC: (Integrated Circuit.) An electronic circuit or combination of circuits contained on semiconductor material; the basis of a computer's intelligence.

Input: The data that are entered into the computer; the act of entering data.

Instruction: A group of bits that designates a specific computer operation.

Interface: The juncture at which two computer entities meet and interact with each other; the process of causing two computer entities to intersect.

K: Computer shorthand for the quantity 1,024; the term is generally used as a measurement of computer memory capacity.

LSI: (Large-Scale Integration.) The process of integrating a large number of circuits on a single chip of semiconductor material.

Machine language: The language that each machine understands.

Magnetic tape: A recording device used to store programs and data. Resembles audio tape used in tape recorders.

Memory: The section of the computer where instructions and data are stored; synonymous with storage.

Microcomputer: A small computer in which the CPU is an integrated circuit deposited on a silicon chip.

Minicomputer: A computer that is usually larger, more powerful and costlier than a microcomputer but is not comparable to a mainframe in terms of productivity and range of functions.

Modem: A specialized device used to attach a computer or one of its devices to a communication line, often a telephone.

Operating system: A series of programs generally provided by the computer manufacturer that perform the computer's basic, most heavily used functions.

Output: The information generated by the computer.

Peripheral: A device--for example, a CRT or printer--used for storing data, entering it into or retrieving it from the computer system.

Plug-compatible hardware: Computers that can be operated with software originally developed for other kinds of computers; usually refers to hardware, manufactured by competing companies, that can be plugged into systems designed for other equipment.

Program: A set of coded instructions directing a computer to perform a particular function.

Programming language: A set of words and rules that constitutes a language understood by the computer and operator alike.

Realtime: The processing of data as soon as it is entered into the computer.

Response time: The time required for the system to respond to a user's request.

Semiconductor: A material such as silicon with a conductivity between that of a metal and an insulator; it is used in the manufacture of solid-state devices such as diodes, transistors, and the complex integrated circuits that comprise computer logic circuits.

Software: A general term for computer programs, procedural rules and, sometimes, the documentation involved in the operation of a computer.

Storage: See memory.

System: The computer and all its related components.

Terminal: A peripheral device through which information is entered into or extracted from the computer.

Throughput: A measure of the amount of work that can be accomplished by the computer during a given period of time.

Timesharing: A method for more than one person to use the computer simultaneously at separate terminals with a given time.

Turnaround time: The measure of time between the initiation of a job and its completion by the computer.

Word: A group of bits that the computer treats as a single word.

Word length: The number of bits in a computer word.

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